

# Ontology-Based GIS User Interface

Aistis Simaitis

## How do computers understand maps?

Maps are stored as sets of polygons and relations between them ("externally connected", "part of", etc.). Polygons have labels (water, land, tree, house, etc.). Ontologies are used to store definitions of geographic concepts that can be derived from basic objects. For example, a simplified island definition might be "A polygon is an island if it is land and every polygon that is externally connected to it is water". So, if we ask a computer to highlight all islands in the given map it will look-up the island definition in the ontology, evaluate it with respect to the map data, and colour all polygons that matched the query (see figures 1 & 3).

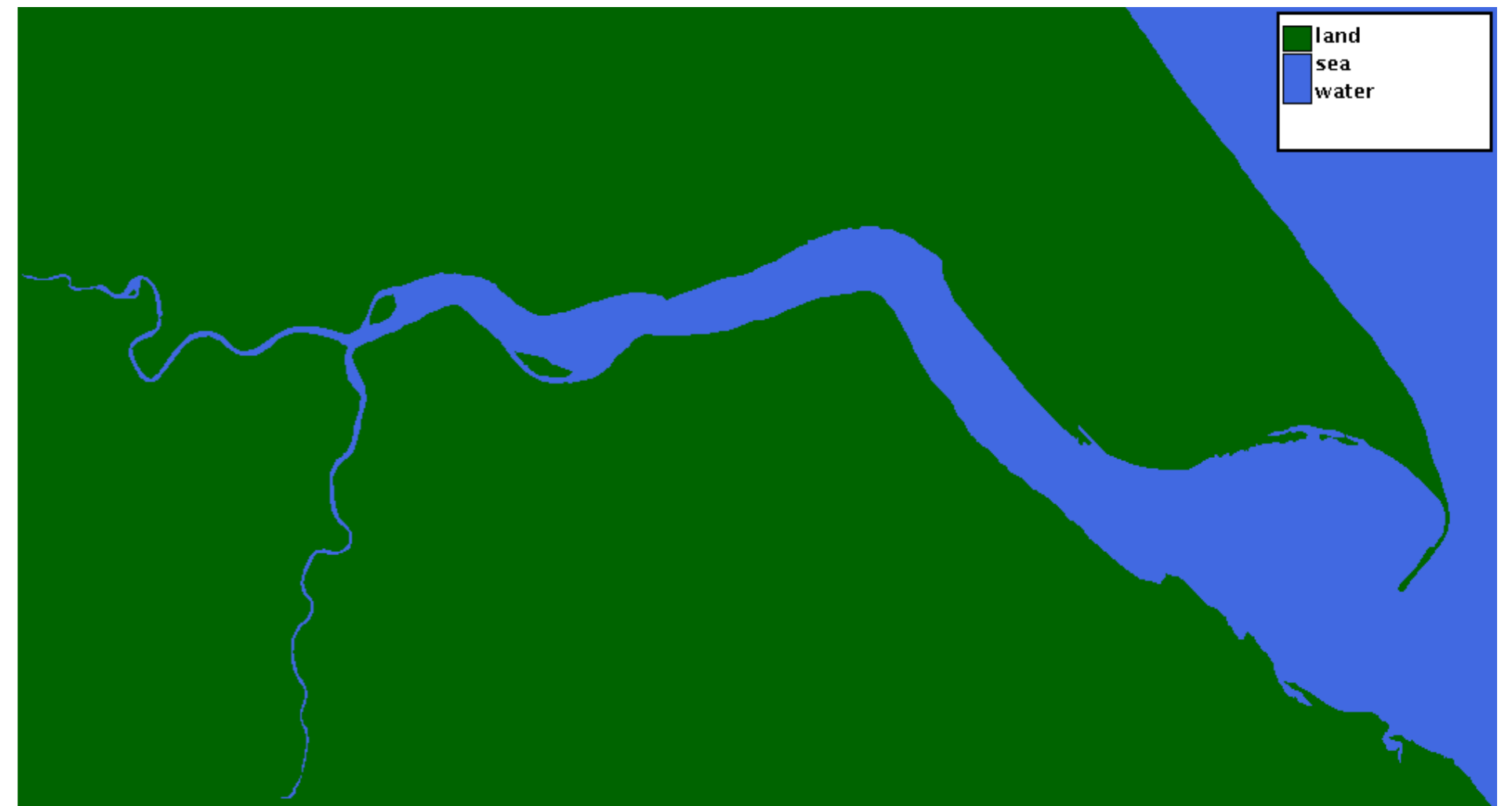


Figure 3. Basic map.

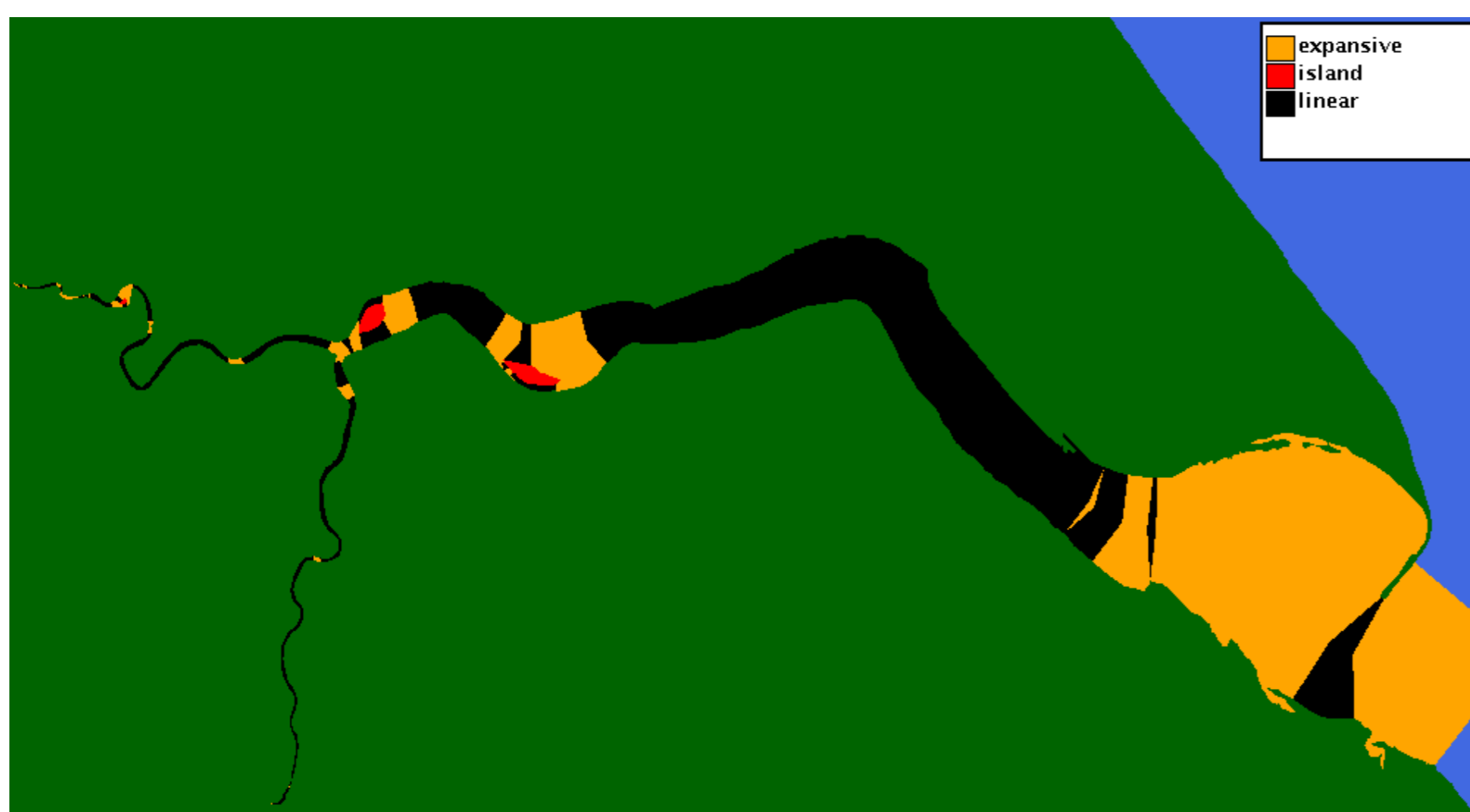


Figure 1. Map with highlighted polygons.

## Web interface to reasoner

The Web interface for this Geographic Information System (GIS) was built using Java Servlets which communicate with a Prolog reasoner using sockets. The interface provides users with the opportunity to query GIS for data sets, browse the ontology, edit and create object definitions and a convenient way to label, display and compare results (see figure 2).

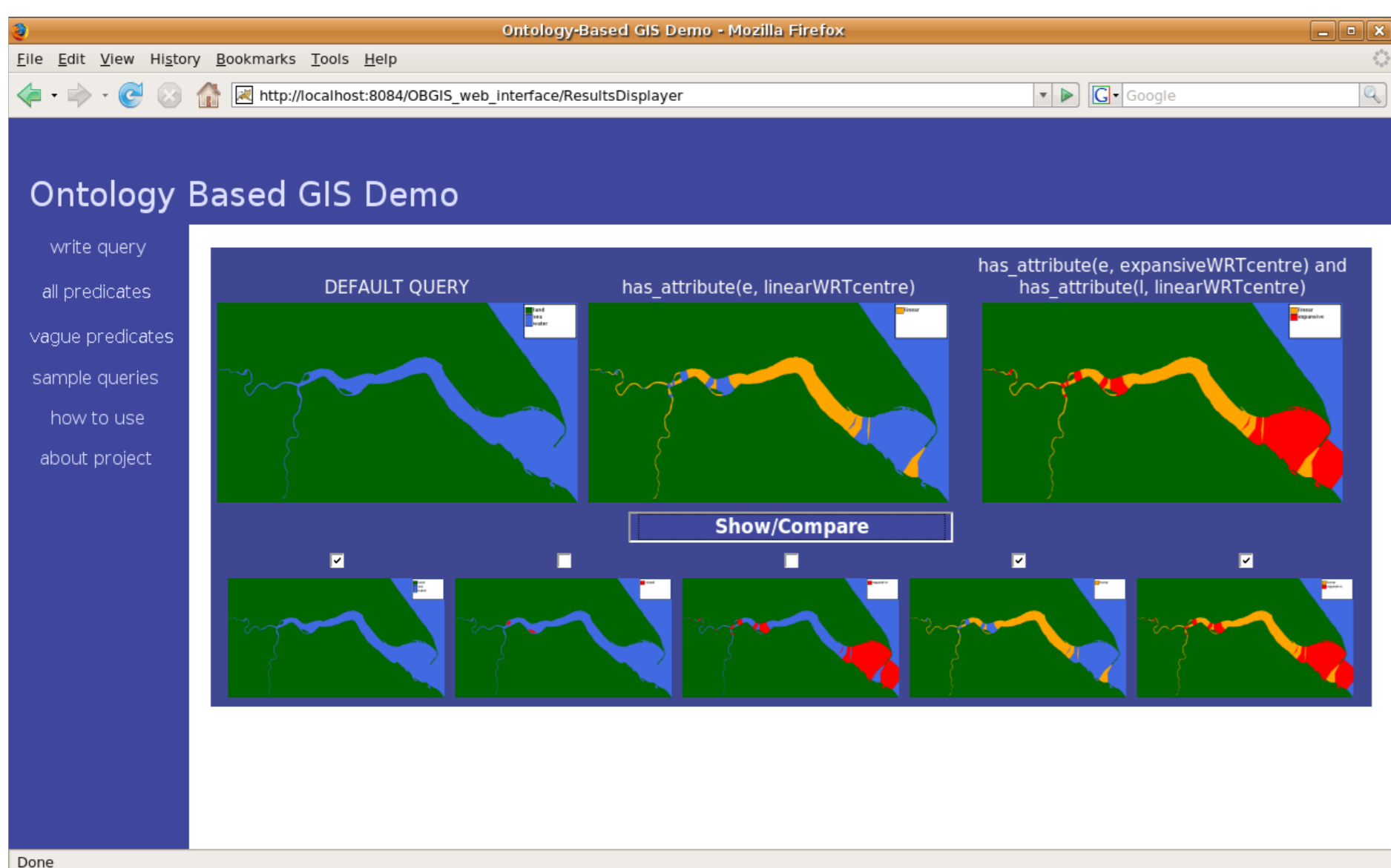


Figure 2. User interface - results display section.

## What is ontology?

Ontology (in computer science) is a way of representing knowledge about some domain. It is usually specified as set of concepts together with logical relations between them (see figure 4).

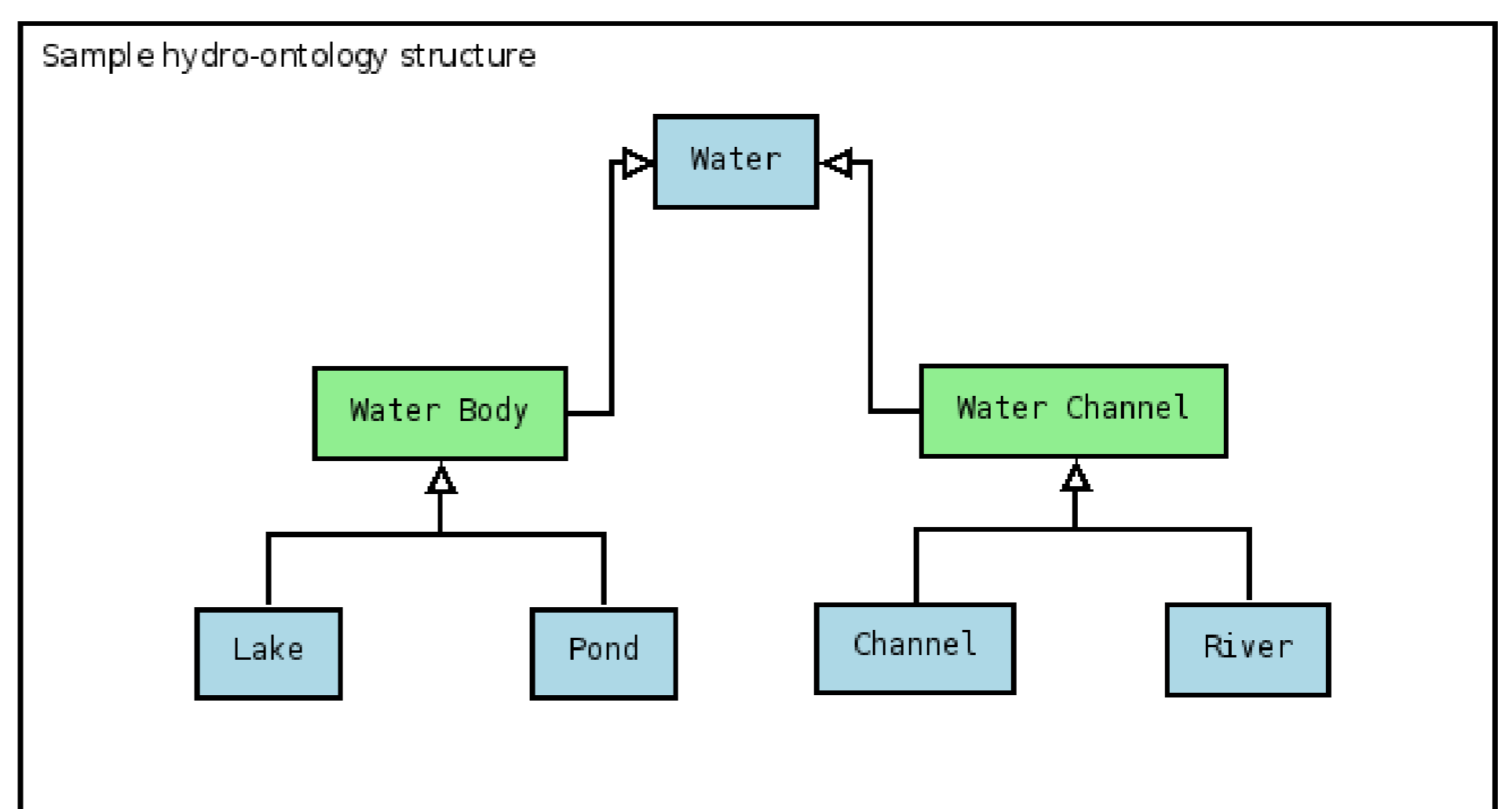


Figure 4. Sample hydro-ontology.

## Dealing with vagueness

Most geographical definitions are vague or contain vague parameters, for example, streams are usually defined as 'small or tiny rivers'. In order to deal with such definitions, a computer requires an unambiguous boundary between 'small' and 'not small'. These boundaries are defined by introducing threshold parameters which form the particular standpoint from which data can then be interpreted (see figure 5).

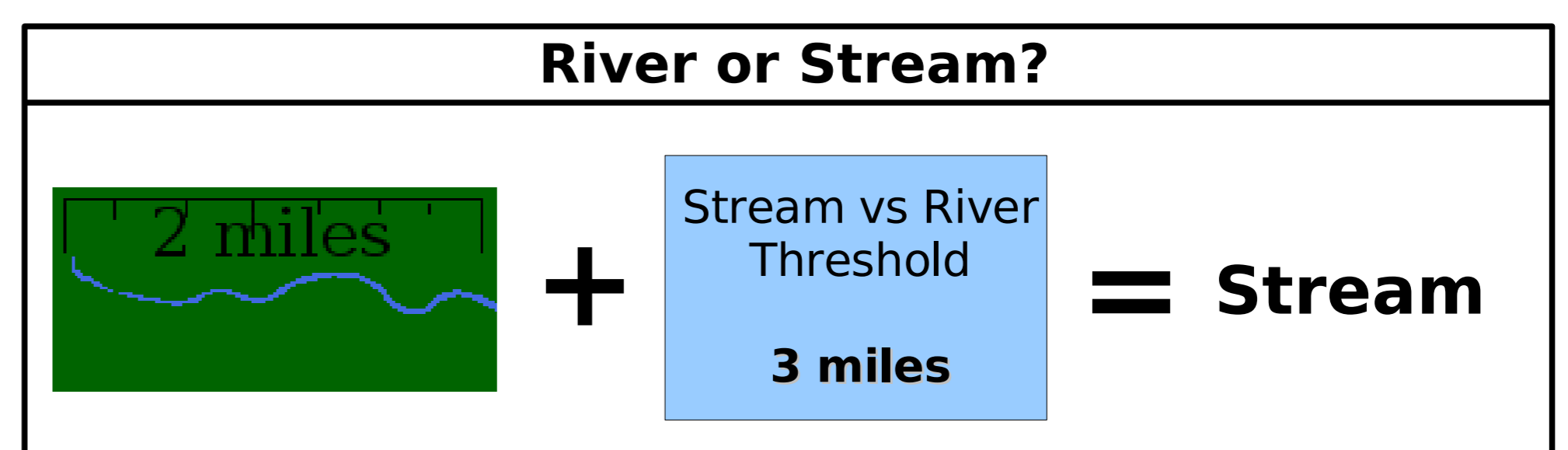


Figure 5. Sample decision making diagram.